

WE CLAIM:

1. In a reactor vessel containing a methane hydrate solid material, a process for separating carbon dioxide from a gas mixture comprising said carbon dioxide and methane, said process comprising the steps of:

contacting said methane hydrate solid material with said gas mixture, forming carbon dioxide hydrate; and

removing said methane from said reactor vessel.

2. A process in accordance with Claim 1, wherein said carbon dioxide comprises at least about 30% by volume of said gas mixture.

3. A process in accordance with Claim 1, wherein at least a portion of said carbon dioxide hydrate is removed from said reactor vessel.

4. A process in accordance with Claim 3, wherein said carbon dioxide hydrate removed from said reactor vessel are decomposed, forming carbon dioxide and water.

5. A process in accordance with Claim 1, wherein a portion of said methane removed from said reactor vessel is used to form said methane hydrate solid material.

rule 126

6. A process in accordance with Claim 1, wherein said reactor vessel comprises one of a fixed bed, fluidized bed and a moving bed of said methane hydrate solid material.

Rule 126  
7 ~~8~~. A process in accordance with Claim 1, wherein said methane hydrate solid material is interstitially incorporated in a particle bed.

8 ~~9~~. A process in accordance with Claim ~~8~~ <sup>7</sup>, wherein said particle bed comprises sand.

9 ~~10~~. In a gas mixture comprising a more stable hydrate-forming gas and a less stable hydrate-forming gas, a process for separating said more stable hydrate forming gas from said less stable hydrate forming gas comprising the steps of:

introducing a first hydrate solid material produced by said less stable hydrate forming gas into a reactor vessel;

contacting said first hydrate solid material with said gas mixture, whereby said first hydrate solid material is displaced by a second hydrate solid material, said second hydrate solid material formed by said more stable hydrate forming gas; and

removing said less stable hydrate forming gas from said reactor vessel.

Rule 126

10

9

~~11~~. A process in accordance with Claim ~~10~~, wherein said more stable hydrate forming gas is carbon dioxide.

11

9

~~12~~. A process in accordance with Claim ~~10~~, wherein said less stable hydrate forming gas is methane.

12

9

~~13~~. A process in accordance with Claim ~~10~~, wherein at least a portion of said second hydrate solid material is removed from said reactor vessel.

13

9

~~14~~. A process in accordance with Claim ~~10~~, wherein a portion of said less stable hydrate forming gas removed from said reactor vessel is recycled to form said first hydrate solid material.

14

9

~~15~~. A process in accordance with Claim ~~10~~, wherein said first hydrate solid material in said reactor vessel is disposed in one of a fixed bed and a moving bed.